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AN
EXPERIMENTAL INQUIRY
INTO THE
CONSTITUENT PRINCIPLES
OF THE
SULPHUREOUS WATER
AT
NOTTINGTON NEAR WEYMOUTH:
TOGETHER WITH
OBSERVATIONS relative to its APPLICATION
in the CURE of DISEASES.

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*Nec te poeniteat duros subisse labores,
Aut operi insuetas attenuasse manus.*

TIBULLUS.

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INTRODUCTION.

***D**URING my attendance at Weymouth last Summer, I was induced to make, by the use of a few chemical tests, some trials on NOTTINGTON WATER, without any view whatever to their publication. But as the result of these experiments turned out different from what I had reason to expect, having read the accounts given by different Writers of its Mineral Contents, I resolved in the Spring following to prosecute my inquiries still further, with the hope of investigating more accurately the nature of the several substances contained in it; and, with the advice of some friends, to communicate the result of them to the public. In doing this, I have not confined myself to a tedious detail of experiments,*

experiments, uninteresting to the generality of readers, and calculated only for the perusal of those who have acquired some knowledge in the Science of Chemistry; but for the use of such invalids as may be led to employ the Water medicinally, have subjoined an account of its probable virtues in particular diseases, with remarks interspersed on the most eligible mode of its application.

It would have been scarcely necessary to mention here how particularly serviceable is a Complete Examination of a Mineral Water, in the way of Chemical Analysis, as a guide by which we are directed to the most judicious and successful application of it for the purposes of Medicine, if a late Writer on the Nottingham Water, speaking of such researches, had not detracted from them much of that importance which now in general is considered as their due. Though he seems apprized that great discoveries and useful improvements are continually made in analysing Mineral Waters; yet, perhaps, it would be doing him no injustice, but even acting with

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with commendable lenity, to imagine that he was not fully aware of all the valuable discoveries, respecting the composition of these fluids, made by Modern Chemists; for, otherwise, he surely could not have treated, with so much indifference and contempt, the very material assistance towards ascertaining their Medicinal Properties, which Chemical Researches, when rightly performed, are capable of affording. Indeed, so considerable is the light which has been diffused on this important part of Nature's works, by the successive discovery, and diligent examination of their nature and properties, of the several aëriform fluids, viz. cretaceous acid, phlogisticated and hepatic air, that the impenetrable veil lately thrown over it is now happily removed; and hence our ideas concerning those popular remedies are become proportionably more determinate, satisfactory, and clear.

Among other considerable advantages to be derived from the Analysis of Waters, the celebrated BERGMAN has very judiciously observed—" If
" long

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“ long experience has shewn the efficacy of the
 “ water in a certain fountain, and if at the same
 “ time the contents of that water be known, we
 “ are enabled to anticipate the experience of years,
 “ and instantly to form a judgment concerning the
 “ virtue of other waters, which exactly resemble
 “ in their contents the water whose properties
 “ are already established”(a). Thus, with regard
 to Nottingham Water, (the subject of the few fol-
 lowing pages) without even the least personal expe-
 rience of its particular effects, one might be able,
 from a knowledge of the heterogeneous matters con-
 tained in it, joined to that of any other similar
 water, whose mineral contents and medicinal pro-
 perties have been sufficiently investigated, to fix its
 virtues, and predetermine its operation with little
 fear or probability of mistake.

Of what importance and advantage to the com-
 munity, the *Analysis of Mineral Waters* has long
 been esteemed by men of learning and celebrity,

(a) See *Physical and Chemical Essays*, vol. 1. p. 112.

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we may sufficiently judge from the number that have directed their labours this way, and the uniform tenor of their writings in recommending it to others: And yet the early labourers, in this field for investigation, were highly sensible of their insufficiency to explore its various products, with ample satisfaction, alike to others and themselves. Under this consideration, together with the present improved state of our knowledge relative to the precise nature of these fluids, the propriety of prosecuting such inquiries further, must appear exceedingly obvious. It is true, that on most of the medicated waters of this country, that of Nottingham not excepted, several trials have been instituted with a view to discover their respective contents; but these laudable attempts were chiefly made prior to the late noble discovery of the different gases already mentioned, which, as it is now well known, enter very copiously into the composition of particular waters, highly celebrated for their healing virtues, and on which their
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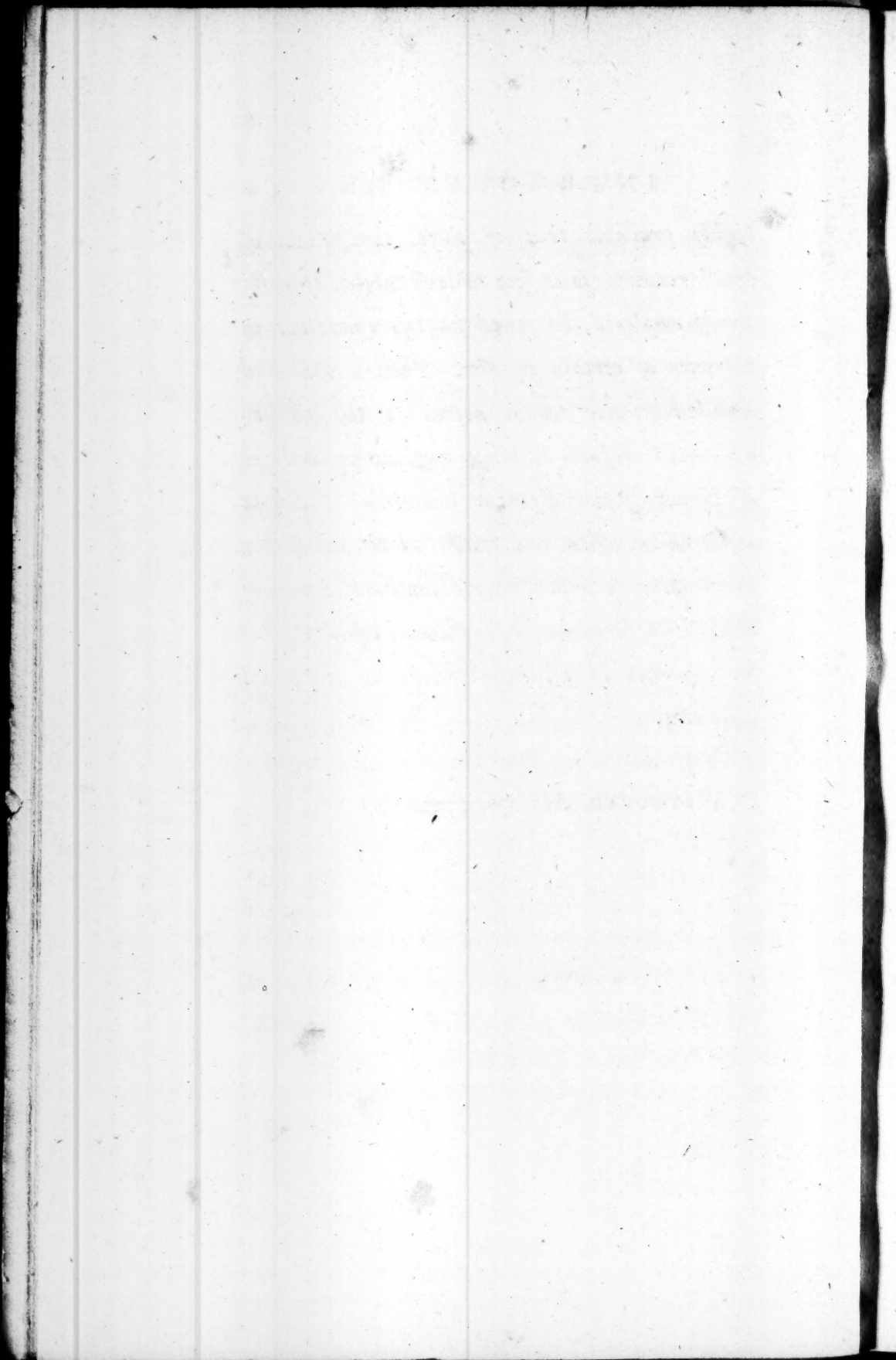
great usefulness and activity more especially depend. That the greater part, therefore, of the analysis of waters, with which we are as yet furnished, is inaccurate or incomplete, there is no small ground for presuming; whence it may deserve to be earnestly recommended to such as possess sufficient knowledge and opportunities for the purpose, to enter on a thorough investigation, in order to confirm or disprove the respective accounts of the several mineral waters which writers of a distant period, and others who have only copied after them, have given us.

Of the celebrated Waters of Bath, Cheltenham, and Harrogate, judicious accounts have been lately communicated to the public by men of distinguished learning and abilities. And it is to be hoped, that the laudable example of these able inquirers after truth, will be studiously followed by others, in ascertaining by suitable experiments the genuine nature and properties of other medicated waters; for it is
highly

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highly probable that of these, though not of equal renown, some few at least might, if judiciously employed, be found no less efficacious in the cure of certain diseases. Thus a real and manifest service would accrue to the public; and, with regard to those various productions of Nature separately, our knowledge would be rendered more firm and exact, which, amidst the many valuable improvements continually making in various departments of Science, could not but be approved by all enlightened and impartial observers.

WEYMOUTH, Aug. 30, 1792.





OF
NOTTINGTON WATER.

PART I.

Of the Situation, sensible Qualities, &c.

ABOUT the distance of two miles from WEYMOUTH, between which place and DORCHESTER, a little to the westward of the turnpike road, lies NOTTINGTON, a small hamlet, in which there is a Mineral Spring. This spring, surrounded by a stone edifice, is situate about three or four yards from a rising ground to the south; on the opposite side of it, at a short distance, runs the river *Wey*. Within the space of ten or twelve yards from the well there are dif-

ferent places on the west, which manifestly exhibit the presence of sulphureous matter; especially when the season is wet, so that the water collects above the surface of the ground. Some of the contiguous standing water by the river appears to be slightly impregnated with iron, but betrays no signs of a sulphureous quality. On the inside of the well may be clearly distinguished a circular whitish border, which marks the height to which the water commonly rises; and along the channel by which the water is discharged a copious yellowish white deposition may be seen adhering to the blades of grass and stones over which it flows. Of these, some are tinged with a blackish colour, resembling æthiops. The white yellowish matter, when collected and gently dried, being laid on a red-hot iron, burns with the blue flame and smell of sulphur.

Nottingham Water when taken fresh from the well appears, in general, as clear and transparent as pure fountain water; emits a strong sulphureous odour, resembling that of the scorings of a gun; and has a taste which

which may be not unfitly compared to that of an egg boiled hard. By exposure to the atmosphere, in an open glass vessel, it gradually becomes of a light pearl colour; loses its fetor; and deposits a whitish sediment.— Though it commonly possesses great clearness and transparency, yet these qualities are sometimes considerably injured, and then it appears of a light opal or milky hue.

Whether this water has ever been known to freeze, it is impossible rightly to determine, since no one that I could learn recollects any instance of the kind. In the month of April, when the weather was exceedingly warm, and the thermometer stood at 64° . in the shade, the temperature of the water in the well was 49° . while the adjoining river made the mercury in the thermometer rise to 57° . About the middle of July it was raised to 52° . the thermometer standing at 66° . in the shade, and the water in the river at 63° .

With the help of a small pair of scales of tolerable nicety, I carefully weighed an equal quantity of this and of distilled water,
having

having previously brought them to the same temperature; the specific gravity of the former I found to be to that of the latter as 1,00048 to 1,00000.

*Appearances of NOTTINGTON WATER with
Precipitants (a).*

Iron, &c. With tincture of galls, or with ferruginous prussiate of potash, Nottingham Water exhibits no signs of any thing metallic.

Carbonic acid Gas, or cretaceous Acid. Tincture of turnsole receives no change of colour;

(a) That the learned reader, from the subsequent facts, may draw his conclusions, with the less difficulty, concerning the different impregnations of this Water, I have annexed to each of the mineral substances likely to be contained in it, the appropriate experiments under one head, by which it may be readily discovered, whether any such particular substance be present or not; and from which also its state of combination may be in some measure determined. The only objection which can with any reason be urged against the use of this method is the necessity of repeating experiments with tests that have been before mentioned. But the number of instances is small in which this repetition becomes absolutely necessary; and, in other respects, that this method of arranging the experiments, partly for the reason already assigned, has a considerable advantage over that of detailing them separately, according to the successive admixture of the several precipitants employed, will, I trust, prove sufficiently obvious without being further insisted on.

nor

nor does the sulphuric or vitriolic acid occasion any immediate effervescence, but in a short time it produces an extrication of air bubbles, which are seen attached to the bottom and sides of the glafs.

Sulphurated hydrogen Gas, or hepatic Air.

The fuming nitrous acid soon occasions a milky cloudiness, at the same time diminishing the fetid odour; and at the end of twenty-four hours a subtile white powder is deposited at the bottom of the glafs. A few grains of white arsenic immersed gradually grow yellow, and at length acquire the nature of orpiment.

Alkaline or earthy Sulphure, or Hepar Sulphuris. The sulphuric acid no way injures the clearness or transparency of the water; nor does it in the least restore the sulphureous smell after it is once lost by exposure to the air.

Fixed Alkali. Syrup of violets is quickly rendered of a light or sea green colour, which continues for many hours unchanged (b),

(b) It has been observed by M. Neumann and the Count de Saluces, that syrup of violets rendered of a green colour by alkaline liquors
and

and paper tinged red with an infusion of Brazil wood is changed to a purple. These effects become more perceivable, after the water has undergone a suitable evaporation; and now paper made yellow by turmeric, which before suffers no alteration, is turned somewhat, though slightly, brown.

Lime, or calcareous Earth. The oxalic or saccharine acid produces considerable turbidness, and by degrees a copious whitish precipitate falls to the bottom and on the sides of a glass, which does not dissolve by

quickly passes from thence to a yellow; but when thus changed by neutral salts, it suffers no further alteration. But with regard to this reagent it may be proper to remark, what I have repeatedly experienced, that it is not made green by any of the neutral salts, unless there be present a superabundant portion of alkali; in which case the change continues permanent. The neutral salts then do not possess the property of converting syrup of violets to a green, without the presence of some additional alkali; yet, when once the green colour is produced, they serve to render it permanent, whereas that occasioned by an alkali alone, in the space of three or four hours, sensibly passes to a yellow.

The property of changing syrup of violets to a green is not peculiar to alkalis only; for the earths, lime, magnesia, &c. readily produce the same effect; and it may be supposed that this property remains uninjured in any of the terrestrial salts with an over proportion of its earthy basis. Alum, as M. Baumé first discovered, is capable of combining with its earthy basis, argillaceous earth, in excess; and thus it acquires new characters, among which that of converting syrup of violets to a green is enumerated.

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the addition of any superabundant quantity of the acid (c). The same is also observable after boiling, though an earthy matter is thereby deposited, which on examination evidently partakes of a calcareous nature.

Magnesia. Caustic volatile alkali, or ammonia, in a short time occasions whitish flocculi, which gradually subside to the bottom of the glass; and lime water immediately causes a milky turbidness. The copious precipitate which the latter of these substances produces, readily dissolves in distilled vinegar. These effects are likewise in a slight degree observable, after the water has been somewhat concentrated by evaporation (d).

(c) Bergman observes, that the acid of sugar possesses a stronger attraction for magnesia than the sulphuric, nitric, or muriatic acids; and that the compound arising from it with that earth, in the form of a white powder, is not soluble either in water or spirit of wine, unless the acid be superabundant. Saccharated lime, notwithstanding any such means, it is well known, remains perfectly insoluble.

(d) From the experiments here related, it might perhaps be inferred that this water contains a magnesian or an aluminous salt. For this reason it may not be improper to observe, that though the volatile alkali made use of, did not effervesce with acids, or render lime water milky, yet from the known difficulty of preserving it pure, there is room to doubt whether it was so completely deaerated as to lose the property of decomposing calcareous salts by a double elective attraction. That the Nottingham water contains sulphate of lime and aerated magnesia, will afterwards be shewn. It is therefore no way difficult, on the supposition here advanced, to explain how the above appearances were occasioned.

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Alumine,

Alumine, or argillaceous Earth. Of the earthy matter which is deposited by a long evaporation, a small portion of a whitish colour, remains undissolved after the affusion of distilled vinegar.

Sulphuric or vitriolic Acid. Muriate of barytes produces a slight cloudiness, and at the end of twenty-four hours a small portion of a whitish coloured matter is adherent to the bottom and sides of the glass. Acetate of lead immediately occasions considerable turbidness, and a dark brown coloured precipitate quickly ensues; of which a small part resists the action of distilled vinegar.

Muriatic Acid. Nitrate of silver instantly produces a considerable dark cloudiness, and by degrees a copious brownish curd-like matter subsides to the bottom of the glass. The same effect is also observable, excepting a difference of colour, in a glass of the water, to which a few drops of nitrous acid have been previously added. With nitrate of mercury the water is immediately made turbid, the upper part of which appears of an exceedingly dark brown colour, and the lower of an obscure yellowish white, containing a
large

large portion of curd-like sediment of a similar hue.

Principles collected by Evaporation.

IN order to ascertain the proportion of the fixed principles with which the Nottingham water is impregnated, two gallons of it, wine measure, were carefully evaporated to dryness in a *balneum mariæ*; the quantity of residuum obtained, which was of a whitish brown colour, amounted to 63 grains. To this residuum was first added a small portion of rectified spirit, and the whole well shaken together, with a view to separate any deliquescent salt it might contain; after standing some hours the liquor was filtered, and by a gentle heat evaporated to dryness. A saline substance, weighing upwards of two grains, was thus procured; consisting of muriatic acid, as evidently appeared by a grey fume becoming visible on the affusion of concentrated sulphuric acid, and of an alkali, as a watery solution of it did not grow turbid with the addition of a few drops of

aqua kali. To determine the nature of the alkali no attempt was made, the quantity of it being much too inconsiderable for any adequate trial; the want of this, however, is in a great measure supplied by the subsequent experiments, which clearly denote it to be of the vegetable kind.

To the residue were next added eight times its quantity of cold distilled water; the mixture was shaken, and after remaining some time, it was filtered. The clear liquor which shewed manifest signs of a disengaged alkali, being evaporated to dryness, left a substance twenty-four grains in weight. In order to discover the species of this disengaged alkali, and to separate it from the neutral salt with which it was combined, the following method was employed:—On the substance procured from the aqueous solution just mentioned, I poured a small portion of distilled vinegar, which dissolved the whole; to this, after carefully reducing it to dryness, a little rectified spirit was added, because, as M. Gioanetti has remarked, it dissolves an acetated alkali, without acting on marine salt. After separating the clear spir-
rituous

tituous part from the insoluble, and causing it to evaporate, I collected a dry brownish substance, which, exposed to the air, quickly attracted moisture, and at length became fluid. Hence we may conclude the alkali to be of the vegetable kind; for, as M. De Morveau has observed, distilled vinegar forms, with the fossile alkali, a foliated crystallizable salt, but with the vegetable a salt strongly deliquescent.

Having determined to what species the disengaged alkali belonged, it next became requisite to examine the nature of the neutral salt with which it had been united. For this purpose I subjected a little of it to the action of concentrated sulphuric acid; immediately a grey fume arose, which was rendered more visible by applying to the mouth of the phial a piece of paper moistened with water. Over the phial I likewise held paper impregnated with volatile alkali, but the colour of the fume continued unchanged. These experiments then shew the acid to be of the muriatic kind. To the remainder of the neutral salt, dissolved in a little distilled water, was added a small portion of tartareous acid
that

that the nature of the alkali also might be equally ascertained. After standing some time, a whitish precipitate ensued; which affords a very sufficient proof that it was the vegetable alkali with which the marine acid was united; for had the fossil alkali only been present, no decomposition would have taken place, because it possesses less attraction for the tartareous acid than for the marine (e).

The residuum, which proved insoluble in pure cold water, was boiled for a quarter of an hour, in about five hundred times its weight of distilled water, and the liquor afterwards filtered. To the filtrated solution I added a portion of *aqua kali*, which quickly produced considerable turbidness, and a white precipitate ensued. This collected by filtration amounted to something more than three grains; which, one may reasonably

(e) Though the tartareous acid, according to Bergman and others, has less affinity with alkalis than the mineral acids, yet it decomposes in part sulphate, nitrate, and muriate of kali; and separates such a portion of their base as is required to convert it into the state of tartareous acidule, or cream of tartar. And as it does not produce the same effect on nitrate and muriate of soda, it has been advantageously employed as an adequate test to discover the species of fixed alkali combined with the muriatic acid in medicated waters.

suppose,

suppose, to have consisted of near two parts of pure lime, to one of carbonic acid, since, according to the observation of Bergman, the carbonic acid gas, expelled from carbonate of lime in burning, is equal in weight to about 0,34 of the crude mass (f). The quantity of sulphate of lime, therefore, dissolved by the boiling water, we may conclude to have been about eight grains, it having been estimated that of selenite not quite a third part is constituted by pure lime (g).

On the insoluble parts, which remained after boiling, was poured some distilled vinegar, and the mixture frequently shaken; this being filtrated, and the clear solution evaporated to dryness, a white filamentous substance was procured, which, on exposure to the air for some time, slightly deliquesced. Hence the presence of magnesia is clearly pointed out; for, as Bergman has remarked, acetite of lime is permanent in a moist air, but deliquescent, if any portion of acetite of magnesia be united with it. In order to as-

(f) Physical and Chemical Essays, vol. I. p. 32.

(g) Ibid. p. 180,

certain

certain the respective proportions of these two earths, I made use of diluted sulphuric acid, so that sulphate of lime and sulphate of magnesia were formed. These two compounds, on account of the difference between them in solubility, I obtained separate without much trouble, and by evaporation determined the quantity of each. Thus with calculation the proportion of lime and magnesia was made determinable, knowing that 100 parts of sulphate of lime, when well dried, contain 42 of earth, and that 36 parts of earth are contained in a centenary of sulphate of magnesia when perfectly dry (h).

What remained undissolved after the affusion of distilled vinegar was subjected to the action of muriatic acid, which dissolved the whole, excepting two grains. With the argillaceous earth, therefore, it appears that a small portion of siliceous was united.

(h) Ibid. p. 180.

Principles obtained by Distillation.

HAVING thus determined both the nature and quantity of the fixed principles contained in this water, it was next necessary to inquire also into its ærial contents; since of the different mineral waters to be met with in this and other countries, it is now well known to every one at all conversant in their chemical as well as medical qualities, that the more celebrated owe their principal virtues to the æriform fluids dissolved in them. Having provided myself therefore with a pneumatic machine, holding exactly half a gallon, wine measure, and constructed agreeably to the directions given by my ingenious friend Dr. Garnett, of Harrogate (*i*), I filled it at the well, and immediately placed a graduated phial of rain water, heated to about 100°, over the tube. The whole apparatus was then put on the fire, and the water made to boil gently, during which numerous bubbles of air were extricated and arose into the inverted phial. The quantity of permanently elastic fluid collected in this way,

(*i*) New London Medical Journal, vol. i. p. 233.

after making the necessary allowance for rarefaction by heat, amounted to $6\frac{1}{2}$ cubic inches. This fluid, on being agitated with lime water, immediately occasioned a milky turbidness, and at the same time imparted to it a slight sulphureous smell. The whole of it was also quickly absorbed, excepting two cubic inches, which, notwithstanding long continued agitation, remained undiminished, and which instantly extinguished a lighted wax taper upon its being immersed in them. From these circumstances, I was immediately led to conclude, that this water contains azote, sulphurated hydrogen, and carbonic acid; but in what proportions it remained yet to determine.

Fourcroy, in his analysis of the waters of Enghien, near Montmorency, has recommended litharge to absorb sulphurated hydrogen in the cold (*k*). I therefore filled at the well two full-sized quart bottles, into each of which two ounces of litharge had been previously put; these I carefully corked and agitated, in order that the sulphurated hydrogen gas might the more effectually be attracted by the litharge. After standing

(*k*) Elements of Chemistry, translated by Nicholson, vol 3. p. 496.

about ten days inverted in water, the bottles were then opened, and the water contained in them, which had entirely lost its peculiar fetid smell, being poured into the pneumatic machine, it was caused to boil in the manner as formerly described. The quantity of gas obtained from the half-gallon of water after this treatment, was $4\frac{1}{2}$ cubic inches; two of which, as in the preceding experiment, were not absorbable by water, and instantly extinguished a lighted wax taper when immersed in them. From this experiment, together with the former, it appeared that, in every gallon of this water, wine measure, there are contained at least five cubic inches of carbonic acid gas, or fixed air, four cubic inches of sulphurated hydrogen gas, or hepatic air, and a like quantity of azotic gas, or phlogisticated air.

In collecting the above permanently elastic fluids, however, I could not but entertain a suspicion that, as water, tho' heated to 100° , made a principal part of the means employed, their quantity must have been somewhat diminished, in consequence of some remaining aptitude or disposition in the water, to absorb them while passing thro' it. In order,

therefore, to satisfy myself with respect to this matter, the two following experiments were carefully made. 1. Thro' a column of rain water, near seven inches in height, and equal to that employed in the preceding experiments, at the temperature of 100° of Farenheit's thermometer, six cubic inches of carbonic acid gas were passed gradually, bubble by bubble, from the mouth of a common four ounce phial; the quantity of gas remaining after this process, on making the necessary deduction for its increased rarefaction from the heat of the water and containing phial, was five cubic inches nearly.—

2. Of three cubic inches of sulphurated hydrogen gas, which were next passed from a common two ounce phial, through an equal height of rain water heated to 100° , and in the same gradual manner as in the last experiment, one cubic inch and half only remained unabsorbed, on the requisite allowance being made for the air's increased rarefaction arising from the additional heat communicated to it. These experiments not only prove the considerable effect of water, though heated to 100° , in absorbing sulphurated hydrogen and carbonic acid gas; but
also

also point out the respective quantities of each liable to be absorbed, under circumstances similar to those here described.

It will, I imagine, be readily perceived that, in transmitting those permanently elastic fluids very gradually thro' water, I imitated as nearly as I could the appearances which occur during the separation of them from a mineral water: And this I did, in order that a proper estimate might be formed of the quantity to be allowed for absorption, in the trials made on the Nottingham water as above mentioned. The absorption of sulphurated hydrogen gas appears very considerable, being one-half of the whole quantity subjected to experiment; and tho' the loss of carbonic acid was by no means in equal proportion, yet it is sufficiently great to deserve notice in inquiries of this nature, where all possible accuracy ought sedulously to be observed.

Upon the whole, I apprehend, it may be fairly concluded, that a wine gallon of this water contains 16 cubic inches of æriform fluid; of which three parts in four consist equally of sulphurated hydrogen and carbonic acid gas, while the remainder is constituted of azotic gas, or phlogisticated air.

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From the foregoing analysis, then, I conclude, that in a single gallon of Nottingham water, wine measure, the subsequent principles are contained, and in the following proportions:

	Grains.
Muriate of kali, or sal digestivus Sylvii, - - -	10 $\frac{1}{2}$
Carbonate of kali, - - - - -	4 $\frac{1}{2}$
Sulphate of lime, - - - - -	4
Carbonate of lime, - - - - -	7
Carbonate of magnesia, - - - - -	3
Alumine, - - - - -	3
Siliceous earth, - - - - -	1
	Cubic Inches.
Azotic gas, or phlogificated air, - - - -	4
Carbonic acid gas, or fixed air, - - - -	6
Sulphurated hydrogen gas, or hepatic air, -	6

BEFORE proceeding further in this inquiry, I think it necessary to introduce a few observations on the methods recommended to be employed, with a view to separate, and thence to ascertain, the respective quantities of sulphurated hydrogen and carbonic acid gas when present in a mineral water; since they will serve, in a great measure, to show my reasons for adopting the foregoing method in the present analysis. Dr. Garnett,
to

to whom the public is indebted for a valuable treatise on the waters of Harrogate, has proposed the use of lime for that purpose (*l*); from a persuasion that this substance will absorb and retain the carbonic acid, and leave only the sulphurated hydrogen gas to be extricated, together with the azotic gas which may exist at the same time. It is evident that, allowing lime exerts no further action on the existent gases than is here supposed, it would prove a very proper and convenient instrument for accomplishing the necessary separation of them. But from a variety of judicious experiments lately instituted, it would seem, that this opinion is not well founded; for, according to these experiments, lime, as well as alkalies both fixed and volatile, possesses a strong disposition to absorb sulphurated hydrogen gas when falling within its sphere of attraction (*m*). How far indeed its power of attracting this æriform fluid may be diminished by the presence of carbonic acid in the water examined, experiments alone can sufficiently determine; if, however, we may in-

(*l*) New London Medical Journal, vol. i. p. 245.

(*m*) Journal de Physique, tom. 40. p. 409, &c.

fer any thing from analogy in this case, it would teach us, that the effect of the acid, as now suggested, is somewhat considerable. —When heat is applied to sulphures made with aërated alkalies, a portion of sulphurated hydrogen is disengaged, along with carbonic acid gas; but, in order to procure any extrication of air from caustic sulphures, an acid is required, which in consequence of its greater affinity seizes the alkali, and by saturating this, gives occasion to the hepatic gas to escape, heat of itself being totally insufficient for that purpose. That carbonic acid, therefore, diminishes the affinity of lime for sulphurated hydrogen, there is strong reason to conclude; yet lime I presume can never be employed with advantage in separating those aëriiform fluids, for reasons which the experienced chemist, on a little reflection, cannot but readily perceive.

The ingenious authors of the experiments above alluded to, finding that the permanently elastic fluid obtained from sulphures made with aërated potash, soda, &c. contained carbonic acid gas, by its extinguishing light and precipitating lime water, were desirous of discovering also the presence of sulphurated

phurated hydrogen. After trying with ammonia and lime water in vain, they had next recourse to nitrous acid; which they were led to make trial of, from an observation of Fourcroy, that it readily decomposes sulphurated hydrogen gas. Nor were they, in the employment of this substance, disappointed in their expectations; for, as they relate, instantly on plunging the mouth of a phial containing gas procured from sulphure of aërated alkali, into nitrous acid, a diminution of the aëriform fluid took place, and sulphur was deposited: the remaining aërial space, on examination, they found to be filled with carbonic acid gas (*n*).

From the result of the experiment as here described, I was strongly inclined to imagine, that nitrous acid might be employed, not only to detect the presence of sulphurated hydrogen when combined with carbonic acid gas, but also to determine the exact proportion of each of these aëriform fluids. Left, however, I should too hastily adopt as a conclusion, what future experiments might contradict, I resolved to try the effect of the acid, after the following manner:—Having

(*n*) Journal de Physique, tom 40. p. 420.

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procured

ing procured an ounce phial of sulphurated hydrogen gas, as pure as possible, I plunged it inverted into nitrous acid; upon which a film of sulphur was immediately deposited, and yet near three fourths of the original quantity of gas remained. From the supposed purity of the gas subjected to trial, I could by no means be induced to think, that this remaining quantity consisted wholly of carbonic acid gas, though it is not improbable but that there was a slight admixture of this; but having omitted to examine it sufficiently, I cannot undertake to specify its nature exactly. The event of the experiment, however, afforded me reason to believe, that the expectations I had formed of nitrous acid, with respect to the use to which it seemed applicable, were insufficiently grounded; and that it was necessary, therefore, to devise some other less exceptionable mode of separating the two species of æriform fluid before mentioned. What could give rise to the difference of result in this experiment, and that immediately preceding, I must confess myself at present unable to determine; since it can scarcely be accounted for, on the idea of the acid not being duly phlogisticated, as that,

that, which I made use of, exhaled copious reddish fumes.

It may perhaps be expected by some, that I should attempt to explain in what manner the aerial impregnation of this water is effected. This, indeed, might very properly form a part of our inquiry; but, as there is reason to suspect that Nature is not always exactly uniform, with regard to the means she employs in hepatifating waters, I fear such an undertaking, if it were attempted, would carry me beyond the limits proposed for this essay. In omitting this part of our subject, therefore, I hope to be excused; and more particularly, as whatever I might here be led to advance, would perhaps be considered as rendered, in a great measure, superfluous by the judicious observations of Bergman(*o*), Dr. Garnett(*p*), and others; to whose valuable works I beg leave to refer such of my readers as may wish for an ample investigation of this curious and intricate point.

(*o*) Phys. and Chem. Essays, vol. 2. p. 343.

(*p*) Treat. on the Harrogate Waters, p. 71. See also Watson's Chem. Essays, vol. 5. p. 31, and vol. 3. p. 197; Walker's Treat. on Harrogate Water, p. 96; and Ash's Exper. and Obser. on the Waters of Spa and Aix-la-Chapelle,

I cannot, however, with equal propriety, omit to offer a few remarks on the co-existence of aerated vegetable alkali and selenite, or sulphate of lime, in this water; which, I trust, is fully demonstrated by what has been already related, however irreconcilable it may appear with the known laws of chemical attraction. Bergman mentions, that he has sometimes met with in Spa water, a small portion of selenite, in the quantity of about one grain to a kanne (*q*); notwithstanding he has clearly shewn, by actual experiment, that it also contains $8\frac{1}{2}$ grains of crystallized mineral alkali. This he accounts for, by observing that substances which are so thinly scattered thro' water, may naturally be supposed to act very slowly on each other; and moreover, that the activity of the alkali is greatly repressed from its union with carbonic acid. This last circumstance he il-

(*q*) Dr. Cullen, of Dublin, having retained the word kanne, which is a Swedish measure, in his translation of Bergman's Chemical Essays, without specifying the quantity it denotes in English measure, I could not well avoid, therefore, employing it here. Whether it is equivalent to $5\frac{1}{2}$ of our wine pints, as is now supposed, I confess I am far from being assured; having been, as yet, unable to obtain sufficient information on that head. This, however, I believe is certain, that the expression does not signify a larger quantity; and consequently, if there be any error, the present reasoning cannot at all be weakened by it, but, on the contrary, will receive additional support.

illustrates

illustrates by stating the difference of effect, which lime and chalk are capable of exerting on a solution of sulphate of magnesia, or Epsom salt:—If to this solution, he says, a little lime water be added, the magnesia is instantly separated from its acid, by the superior attraction of the lime; but if pieces of chalk or calcareous spar be thrown into it, no decomposition can be produced, even by boiling (r).

From these observations, it is easy to understand how the vegetable fixed alkali and sulphate of lime, as contained in Nottingham water, may exist together, without any immediate decomposition. Tho' the quantity of selenite dissolved in this water, is more than double of what Bergman found in Spa water; yet it may be fairly supposed too inconsiderable to occasion any material difference, with regard to the particular now under consideration. Should any one, however, be inclined to expect any perceptible difference, or alteration of appearance, from the superior quantity of selenite as above mentioned; he ought at the same time to recollect, that the quantity of alkali discovered in

(r) Bergman's Physf. and Chem. Essays, vol. i. p. 262.

this

this water, is much less than has been found in Spa water; the latter containing, according to Bergman's analysis, near three grains to a quart, while the former I have shewn to have but one. Any objection, therefore, made to the foregoing explanation of the fact, on account of the additional quantity of selenite, it is manifest, cannot rightly be maintained; since it is clearly counterbalanced by the disproportion of alkali existing in the two waters, as above stated.

That the vegetable fixed alkali is sometimes found, though rarely, in mineral waters, we have ample reason to assert; however difficult it may be to point out the particular manner in which they become impregnated with it. The authority of Bergman (*s*), Fourcroy (*t*), and other eminent chemists may be adduced in confirmation of the fact. M. Monnet relates, that he has obtained it, in a state of considerable purity, united to the carbonic acid, from some of the waters of Spa; and from the experiments made by Dr. Ash on these celebrated waters, we learn the fountains wherein it is present.

(*s*) Phys. and Chem. Essays, vol. I. p. 115.

(*t*) Elements of Chemistry, translated by Nicholson, vol. 3. p. 449.

These

These are the Sauviniere and Groisbeeck fountains; they contain it in different proportions, the latter in the quantity of two grains, and the former in that of one grain, to a quart (*u*). That the vegetable alkali is likewise to be met with in Nottingham water, is a fact which, I apprehend, must have appeared sufficiently obvious from the result of the experiments already enumerated. Dr. Ash observes, that it is most commonly to be found in mineral waters, combined with the nitric acid; but in the present instance, no vestige whatever of this acid could be discovered, on the usual trial being made with volatile alkali. The only acids which this water contains, in combination with the vegetable alkali, we have found to be the muriatic and carbonic.

(*u*) Ash's Exper. and Obs. on the Waters of Spa, &c. p. 250.

P A R T II.

*Observations on the Virtues and Use of Nottingham
Water in the Cure of Diseases.*

THE great efficacy and utility of certain mineral waters denominated sulphureous, in a variety of complaints incidental to mankind, long experience has abundantly confirmed; but whether the sanative powers which those waters have been found to possess, may be more justly ascribed to the sulphureous principle, than to a saline, or any other impregnation associated with it, is a problem which at once cannot rightly be resolved. Experiments have shewn, that the sulphur water at Harrogate contains a large proportion of common salt, and that this, assisted by the presence of other saline substances of a more laxative quality, operates, for the most part, very effectually as a purgative on those, who are induced to drink the

the water in any considerable quantity. In many cases, therefore, there is sufficient ground for conjecture, that the good effects attending a plentiful use of that celebrated water, cannot but be frequently attributable to the evacuation it occasions; and, accordingly, we find it recommended in diseases which, for their alleviation or removal, are well known to require reiterated purgation, or something similar in effect.

But, altho' its usefulness may more especially depend, in many instances, on the evacuant power it possesses, still there are undoubtedly cases in which the sulphureous principle becomes the most active and powerful agent; particularly in the cure of most inveterate foulnesses of the skin, and a few other disorders of a widely different nature. As a proof of this, it may not be improper to mention, on the unquestionable authority of an ingenious writer, that, in some herpetic cases, very powerful and happy effects have been derived from common water impregnated with hepatic air, employed as a substitute for the sulphur water of Harrogate, which had been made use of on a former

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mer occasion, with success (*a*). It has been observed both of the waters of Harrogate (*b*), and of Aix-la-Chapelle (*c*), that they sometimes tinge silver in the pockets of those who drink them regularly for any considerable length of time; an effect which strongly evinces the remarkable subtilty and pervading nature of the hepatic gas they contain, and how little disposed are the circulating fluids of the body to destroy its characteristic properties by effecting its decomposition.

From these and like considerations, it would seem, that in a variety of complaints, especially those of the skin, commonly termed scorbutic, the most happy effects are to be expected from sulphurated waters, when judiciously and properly administered; and from such waters even as have scarcely any saline or other active impregnation, excepting that of hepatic air, to which their salutary virtues might, with any degree of justice, be ascribed.

How far the Nottingham water stands entitled to serious attention and regard, the

(*a*) Garnett's Treatise on the Harrogate Waters, p. 111.

(*b*) Walker's Treatise on the Harrogate Water, p. 155.

(*c*) Lucas on the Waters of Aix-la-Chapelle, &c. p. 148.

foregoing

foregoing analysis may enable us to judge with some degree of precision. For the nature and quantity of the substances contained in a mineral water, being once discovered, there surely can be no great difficulty in appreciating its virtues; if but another water of the same class be at the same time fully known to us, the medical and chemical properties of which have been investigated with equal ability and care.

That this water is not so strongly impregnated with the sulphureous principle as Harrogate water, appears clearly from experiments; and consequently it is not to be expected or supposed, that its medicinal powers will be found equally serviceable in all the several diseases, to which it is adapted. Still, however, I think myself warranted in affirming not only *a priori*, but from actual experience, that, in many instances, no inconsiderable benefit may certainly be derived from it, by being judiciously and properly applied. As to the difference which may be supposed to exist between them, simply on account of its not containing an equal proportion of saline substances, that indeed may be considered as of little consequence; be-

cause the superior quantity of any saline substance can be easily added to the water at the time of using it. This idea has been properly suggested by Dr. Watson, Bishop of Landaff; who observes, that any strong sulphureous water, which naturally contains little or no sea salt, may be rendered similar to Harrogate water, by dissolving in it a proper proportion of common salt (*d*). According to the experiments of Dr. Garnett, besides a very large proportion of common salt, the Harrogate water contains no inconsiderable quantity of muriated magnesia (*e*); which substance therefore ought likewise to be joined, whenever it should be judged necessary to observe accuracy in the imitation.

This water has seemingly, with respect to its chemical qualities, a very near striking resemblance to the Moffat water in Scotland (*f*); and hence it is reasonable to presume, that it may be advantageously employed in those diseases, for the cure of which that water has been so long particularly famed. Possessed of but a small propor-

(*d*) Watson's Chemical Essays, vol. 5. p. 19.

(*e*) Treatise on the Mineral Waters of Harrogate, p. 52.

(*f*) See Edinburgh Med. Essays and Obs. vol. 1. containing Experiments on the Medicinal Waters of Moffat, by Dr. Plummer.

tion of saline bodies, it has been a general practice to drink the Moffat water every day, or every other day, united with a quantity of common, or of Epsom salt, sufficient to produce a laxative effect. Without inquiring into the origin of this practice, there can scarce be a doubt, from its having been continued by people of different rank, that additional good effects have not unfrequently been observed to have resulted from it. But as it is no way uncommon, even with physicians, to have recourse to a remedy on too many occasions, which has frequently succeeded to their wishes, so it cannot be wondered, that the custom above-mentioned should be found much too often followed by the ignorant and undiscerning crowd, or carried to an extent altogether unwarrantable. A late surgeon of Moffat, Mr. Milligen, who no doubt had frequent opportunities of seeing the bad consequences arising from such general and exorbitant use of saline purgatives, has expressed strongly his disapprobation of it; but, at the same time, he acknowledges, that cases sometimes happen, wherein such a practice may be pursued with advantage

tage (g). No one, therefore, ought to enter upon it without sufficient authority; and as there is often observable a material difference in the constitutions of different persons, it can be no less manifest, that, when followed, it will require to be varied and regulated, according to its effects and the intention of the prescriber.

Having premised these few general observations, I proceed now to consider the principal diseases in which the Nottingham water promises to be of service, pointing out at the same time the most suitable mode of applying it, and where its efficacy may be increased with a proper admixture of saline substances.

I before noticed the remarkable effect of sulphureous waters in those cutaneous diseases, which are commonly, but improperly, termed scorbutic, and considered how far their efficacy may be attributed to the hepatic gas contained in them. Though the operation of this species of æriform fluid in

(g) See Mr. Milligen's account of the Virtues and Use of the Mineral Waters of Moffat, related in the Edinburgh Medical Essays and Observations, vol. 1.

all impetiginous disorders is undoubtedly great, yet we are not to imagine it as incapable of increase by having a proper proportion of saline substances combined with it; since the contrary clearly appears from a comparison of facts, as well as from an attentive reflection on the nature of those affections. It is from the union of these different bodies, that the superior virtue of Harrogate water is chiefly to be accounted for.

Hence those that may be induced to make trial of this water, in hopes of obtaining relief from eruptive complaints, should join with it some saline body, in order to give it additional effect. What I would recommend, in general, is a composition of two parts of common salt to one of Epsom, Rochelle, or any other purgative salt; and of this such a portion to be taken twice or three times a week, dissolved in the water, as will render it gently laxative. And on the intermediate days, likewise, I cannot but advise some such saline body to be continued, but in less quantity, and with a much larger proportion of common salt, simply with a view to promote perspiration, and gently stimulate the cutaneous vessels.

As

As to the quantity of water which it may be proper to drink, no fixed or invariable rule can be given, because that will depend much on the age, strength, constitution, and habits of the patient; it may, however, be commonly taken by adults from one pint to three, and upwards, every morning, if nothing forbids, care being at the same time observed not to overload the stomach by drinking too large a quantity at once. When from any circumstance it should become necessary to take it a little warm, I would not advise the whole to be heated on the fire, but to add as much of it, boiling hot, to each glass at the well, as will be sufficient to take off the chilness, and to drink it immediately afterwards. The propriety of this cannot but readily appear, when it is considered how soon the ærial principles, on which its virtues more especially depend, are made to escape by the application of heat.

It is much to be regretted, that the external application of this water, except in a partial degree, cannot be so conveniently conducted as could be wished; since nearly equal benefit has been obtained from sulphureous waters, when employed as a bath,

as

as when taken internally. The Harrogate water, from its having been thought too offensive, or too dangerous for internal exhibition, was at first only used as a bath or wash in diseases of the skin, and many of these, as is said, were thus happily cured by it (*b*). Nor can this appear at all incredible to such as consider those diseases, for the most part, as merely local, and as not being connected with any general affection of the system, while the appropriate nature of the several ingredients, which it possesses, is duly attended to. Even bathing in simple warm water, without any further medical means, has been sometimes attended with success; and I believe it is commonly esteemed of consequence, in the treatment of such affections, to be able to have recourse to that remedy, as an auxiliary at least. What share the saline impregnation had in the above effect, independent of the sulphureous principle, is not easily ascertained; though there can be no doubt of its having afforded material assistance, from the known stimulant and detergent quality inherent in common salt.

(*b*) Garnett's Treatise on the Waters of Harrogate, p. 115.

As a substitute, therefore, for this water where a general warm bath is required along with its internal use, sea water may perhaps be employed with advantage. During bathing, which may be repeated every second, third, or fourth day, if nothing should altogether prohibit its use, it will be proper for those who are afflicted with a dry scaly eruption, to be well rubbed with a flesh brush, or if that should excite too much pain, with a piece of flannel; so as sufficiently to cleanse and deterge the pores of the skin, and thus to render them the more permeable to the perspirable fluid.

Where the eruption is not very extensive, but confined to particular parts, perhaps there will be little occasion for having recourse to general bathing; since whatever good it is capable of producing, may probably be attained with washing only the affected parts daily. In all such cases, therefore, I would recommend the Nottingham water, which will admit of being applied topically with sufficient ease, in preference to sea water, on account of the hepatic air it contains, which seems to act somewhat as a specific in cutaneous complaints. Previous
to

to its being used, however, in that way, it will be advisable, in general, to make it a little warm in the manner before described, and to unite with it a greater or less proportion of common salt, so that its power, as a stimulant, may be duly augmented.

That this water will be found no less beneficial in scrophulous disorders than in those just mentioned, is a circumstance which, however strongly to be wished, is perhaps scarcely to be expected. Yet, if we may rely on the accounts that are given us, concerning the virtues of other waters, to which it bears a very near and striking resemblance, no one can fairly consider it as destitute of power, especially when aided by the use of other remedies, to alleviate greatly diseases of that nature, if not frequently to accomplish the entire removal of them. The Moffat water to which, as I before remarked, it is strongly allied with respect to its mineral contents, owes, I believe, much of its celebrity to the many instances of scrophula disappearing while under its use; and it is even affirmed by Mr. Milligen, that he never once saw it fail of curing that disorder, when continued a sufficient length of time, excepting where

the constitution was too much decayed, or where symptoms existed during which it ought no way to have been employed (*i*). Mr. Bell has likewise given no small testimony in its favour; for speaking of scrophulous tumors, he observes, that the only remedy he has ever experienced to act, with any apparent efficacy, in preventing their suppuration, has been a long continued use of the cold bath, particularly of sea-bathing, and of mineral waters, especially those of Moffat (*k*).

From what is here said, it is obvious, that the Nottingham water deserves at least a candid trial in scrophulous complaints; and as the employment of it may be conveniently accompanied with sea-bathing, there is much ground to hope, that, from the united operation of two such remedies, very material benefit may hereafter be obtained. But, without being regularly and duly persevered in, it would be absurd to expect any great or permanent relief from them. In speaking of the usefulness of Moffat water in such cases, Mr. Milligen observes, that a few seasons were commonly necessary for complet-

(*i*) Edinburgh Medical Essays and Observations, vol. 1. p. 69.

(*k*) Bell's Surgery, vol. 5. p. 510.

ing a cure; and, immediately on the smallest appearance of scrophula supervening, Mr. Bell advises such a situation to be resorted to as that one or other of the remedies before mentioned can be used, with perhaps little interruption, for a number of years. To obtain therefore a full and lasting effect, it is to be supposed, that a single season will seldom prove sufficient, unless indeed the internal use of this water, together with sea-bathing, should greatly exceed the expectations one may reasonably form of it, from a knowledge of the good effects produced by such remedies, when separately employed.

With respect to the quantity of water necessary to be taken, near the same directions may be observed as have been before recommended in diseases of the skin. I imagine that few cases will occur, except among very young children, wherein a less quantity than a pint ought to be drank daily, at proper intervals; and that seldom more than two quarts, if so much, will be required by those who have passed the age of puberty. It is proper to mention, however, by way of caution, that in diseases of this kind, as well as in all others, this water should be very sparingly

sparingly drank while the patient has a cough, or is any way hectically disposed; because, under these circumstances, it seldom fails to occasion an aggravation of symptoms, when taken to the usual amount.

Whether it is likely to derive any additional efficacy from the admixture of any extraneous saline body, is somewhat uncertain; yet I am inclined to think, that a few grains of the fossil alkali, with perhaps a small portion of common salt, would, in most instances, make no improper addition. For, not to mention the utility of natural saline waters in general, it frequently happens that those, who labour under scrophula, are troubled with an acidity of the stomach and primæ viæ; which symptom probably will be best obviated or corrected by something of the above kind.

That an outward application of this water to scrophulous sores would be attended with any advantage superior to what common water is capable of producing, may be justly doubted. At Moffat it has long been the practice among persons so affected, either to wash the ulcers with the sulphureous water frequently in the day, or, which is preferable,

ble, to keep linen cloths, made wet with it, constantly applied to them. Thus, it is said, the sores are rendered cleaner, the pain accompanying them is alleviated, and their healing, in some measure, probably promoted. The same effects, however, have been likewise known to follow the use of common water, as appears from an observation of the late illustrious Dr. Cullen, who mentions, that he has always seen it of equal service with any mineral water commonly employed (1). Whenever, therefore, such an application may be deemed requisite, it will be of little consequence perhaps what kind of water is chosen; for the good effect probably depends wholly on the cold communicated, which, from its great astringent and tonic power, seems well fitted to impart strength and vigour to the relaxed vessels and fibres of the ulcerated part, and thereby to lessen or remove that painfulness so frequently attendant on scrophulous sores.

Concerning the utility of sulphureous waters in paralytic and other affections occasioned by the deleterious operation of lead,

(1) Cullen's Practice of Physic, vol. 4. p. 381.

physicians are all, I believe, nearly agreed (*m*). Nor has the use of such waters been less obvious in cases, likewise, where it was known, that mercury had been too freely or injudiciously administered (*n*). Those complaints, therefore, whose origin may be imputed to an imprudent or accidental application of either of those mineral substances, will probably be found to admit of no inconsiderable relief from this water, when properly employed.

To further its operation in such cases, it should be taken always warm, and in general to the extent of two or three pints, and upwards, every day, observing the necessary precaution already given, not to permit its volatile ærial principles to exhale, before it is swallowed. As it is not recommended with a view to any purgative effect, but rather to occasion a greater determination of the fluids to the surface of the body, it can be of no signification whether the whole quantity is taken, at proper intervals, in the

(*m*) "— And it is more particularly in the palsy and tremblings which commonly remain after the painter's cholic, that this Physician (Navier) boasts of the good effects of liver of sulphur and gaseous hepatic waters". Fourcroy's Chemistry, vol. 3. p. 215, &c.

(*n*) Lucas on the Waters of Aix-la-Chapelle, p. 177.

morning,

morning, or a part is left for the evening, when a glass or two may be drank, if the patient chooses. For by that time, it is to be presumed, that the stomach will nearly have freed itself of any nutritive matter taken in the course of the day.

By a strict adherence to this method, material benefit no doubt would soon be perceived, and at length probably a cure established; but in most instances, particularly those accompanied with any degree of palsy, the salutary effects of the water would become much more quickly discernible, if seconded by an occasional or frequent use of the warm bath; which therefore is also to be strenuously advised in conjunction with it. Could the Nottingham water be conveniently made use of for that purpose, I should certainly recommend it in preference to common water; though a bath consisting of the latter may be found perhaps but little inferior in real efficacy.

Though I must confess I have seen no instance of the anthelmintic virtue of this water, yet, in a few cases of worms, it is said to have been advantageously employed; and, I doubt not, with the occasional aid of

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some further remedy, but it may be often used in such affections, with perfect success. The sulphur water at Harrogate, Dr. Alexander observes, is one of the most sovereign remedies yet discovered (o); and without doubt, it will ever be found effective in expelling those troublesome inhabitants of the human body, with the various volatile and fixed substances which it at present contains. For its vermifuge power cannot properly be ascribed either to its purgative quality, or to its sulphureous impregnation; but to a combination of these. Hence it appears necessary, whenever the Nottingham water, which naturally contains little saline matter, is employed for the cure of worms, that something purgative should be joined with it, or otherwise interposed as occasion may require. As a purgative of the saline kind, sea water will answer, for the most part, exceedingly well, taken in due quantity, and repeated about twice a week. The water itself should be drank daily in such quantity as the age, strength, constitution, and other circumstances of the patient will admit, except on the days of taking the purgative,

(o) Alexander on the Harrogate Water.

when

when perhaps its use ought to be entirely omitted.

For the removal of that species of worm, called the ascarides, or thread worms, it is probable, that repeated injections of the water into the intestines will prove much more effectual than drinking it; as they lie commonly low in the rectum, and therefore may be supposed more liable to be destroyed by a method of that sort, provided due care be taken to prevent any aerial matter in the water from escaping, previous to its being used. I was once informed by a judicious surgeon of Edinburgh, that he had frequently advised sea water to be employed in that way, with remarkable good effect; but what success others have experienced from it, and whether it is much in use, as an anthelmintic remedy, are circumstances equally unknown to me.

Besides the several diseases in which I have here recommended a trial of this water, from a conviction of its efficacy, it is probable, that many others, if not altogether, would at least, in some measure, yield to its use. In spasmodic pains of the stomach, or bowels; in affections of the kidneys arising from

presence of fabulous concretions, or small gravel; and in loss of appetite and tone of the stomach induced by hard drinking, or other habits of intemperance, it promises to be of service. Sulphureous waters have been likewise usefully employed in many cases of rheumatism of the chronic kind; but as these cases seemed to derive more relief from an external application than from an internal, it is scarcely to be presumed, that this water will ever prove of any use in that species of complaint, until some method be taken to remedy the present inconvenience, which would attend the employment of it for the purposes of bathing.



F I N I S.

ERRATA.

Page 8, line 3, for *analysis* read *analyser*.

Page 16, line 12, for *a glass* read *the glass*.

Page 44, line 18, after *very*, read *and near*.



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STATISTICS

1867

General Statement of the
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County of ...
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Population, &c. of the County of ...
for the year 1867

Area of the County of ...
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